Soil Conservation

May 1978

U.S. Department of Agriculture

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From the Administrator

Wildlife Survival—A National Concern

Competition for living space often pits mankind against wildlife—and, as a result, wildlife populations almost always diminish.

For many urban and rural Americans, this is profoundly disturbing.

That is why Glenn H. LeDioyt felt reassured when a covey of Hungarian partridge arrived at his north-central Nebraska farm last year. (See article on page 6.) As he said, "We were as thrilled about it as we were when we calculated that our corn production was over 150 bushels per acre."

LeDioyt's enthusiasm reflects growing national interest in the future of fish and wildlife populations.

Privately owned farms, ranches, and forests—which make up more than half of America's land resources—provide homes for much of the Nation's fish and wildlife. On farmlands, food and fiber production is of primary importance. Yet many acres used for agriculture, range, or forestry also offer ideal nesting sites, food, and cover for a variety of wildlife, as people like Glenn LeDioyt know firsthand.

When a landowner installs conservation practices that protect soil and water resources and sustain yields, he or she also provides wildlife habitat. Stripcropping, farm ponds, windbreaks, woodland management, range seeding, and many other practices make good habitat for wild creatures if properly designed, constructed, and used.

A landowner who wants still better wildlife habitat must, however, use such *additional* conservation measures as grassy nesting areas, wooded escape cover, and properly distributed winter feed. It is a correct combination of practices that fills the gap between conservation for food and fiber and conservation for acceptable wildlife habitat. More and more landowners are working through their local soil and water conservation districts to achieve this goal.

When asked why he planted trees and shrubs for wildlife when more pressing work remained to be done, a farmer spoke for many when he replied, "I seldom have the time to observe the birds and animals that nest in my hedgerows, but it makes me happy just to know that they are there."

That is enough incentive for the Soil Conservation Service to give all the help it can in improving wildlife habitat.

Mel Davis

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Cover:
Wyoming law requires that a reclamation plan be developed for all land disturbed by coal mining. See pages 11 through 18 for an article about surface mine reclamation in Wyoming and Montana. (Photo, Anne Schuhart.)

Soil Conservation

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Wildlife and Watersheds

Planning a little extra land for habitat around watershed reservoirs could make a big difference for wildlife.

Canada geese were among the most common species spotted at the reservoirs.

by Mike W. Anderson

A study in Nebraska proved that Public Law 566 watershed reservoirs attract a wide variety of wildlife.

Some doubt existed that the watershed reservoirs provided habitat for significant numbers of wildlife because the reservoirs were not fenced in and the perimeter areas of many were grazed or used for crops.

The Soil Conservation Service in Nebraska contracted the Associated Environmental Service Company (AESCO) to monitor wildlife for 1 year at 90 sample watershed sites in the State to find out the numbers and kinds of wildlife that used the reservoirs and perimeter areas.

"We selected a representative sample of watershed dams based on engineering characteristics, location, and age," said William B. Patterson, SCS assistant State conservationist for water resources in Nebraska. The sites varied from small weir structures with no permanent water storage to reservoirs with 149 acres of surface water.

"We needed proof that large numbers of wildlife use and inhabit areas around watershed reservoirs. The information could encourage sponsors of watershed projects to obtain enough land around dams and reservoirs for permanent wildlife habitat," said Bob Koerner, SCS State biologist.

C. Michael Cowan, president of AESCO, and one assistant began the wildlife survey in June 1975. They visited each of the 90 sites once every 6 weeks, taking photos and recording their observations of wildlife.

The report of the team's findings, "Wildlife and Watersheds in Nebraska," identifies 186 different species of wildlife. The team spotted 148 species of birds. Twenty of those were waterfowl. "We spotted more than 16,000 ducks and geese," said Cowan. "Migratory waterfowl used all but about 10 of the reservoirs we visited. Most species used the reservoirs just for resting and feeding, but we also observed some species courting, nesting, and rearing their young."

The number of waterfowl at each reservoir varied from a few strays to flocks of hundreds of birds. The most common species, some spotted a thousand times or more, included Canada geese, snow geese, mallard ducks, pintail ducks, widgeons, and blue-winged teals.

"The watershed impoundments increase the acreage of surface water available to waterfowl, opening a larger area of suitable habitat for the birds during migration," said Cowan. "This reduces the concentration of birds at rivers and lakes and decreases the spread of disease among the birds."

Some birds spotted 300 times or more included American coot, bobwhite quail, ringed-neck pheasant, mourning dove, and common flicker.

The survey team also spotted muskrat, raccoon, eastern cottontail, and white-tailed deer around the reservoirs. Bullfrogs, leopard frogs, snapping turtles, and garter snakes were common. Fish identified in the reservoirs included carp, channel catfish, bluegill, largemouth bass, and black bullhead.

Cowan explained that the watershed dams and reservoirs along streams reduce the chances of erosion, flooding, and sediment damage, and can, if properly maintained, create new and varied habitat for a large number of wildlife species. In Nebraska, the many Public Law 566 watershed reservoirs and their perimeter areas are ideal for permanent, year-round habitat for wildlife. SCS recommends keeping about 10 meters of good wildlife habitat between the shoreline of reservoirs and farmland. Grasses along the perimeters of reservoirs provide cover for nesting and help filter sediment from runoff—benefiting fish and improving water quality.

Cowan concluded that for the reservoirs and the perimeter areas to be most beneficial to wildlife they must be properly maintained. As many native plant species as possible should be retained along the perimeters, or the perimeter areas should be planted with a variety of grasses, trees, and shrubs. "Grazing should be kept to a minimum and livestock watering confined to a small part of the perimeter," Cowan said.

"In many cases, where the reservoirs are surrounded by land that is extensively cultivated, the vegetation on reservoir perimeters provides the only cover for upland game birds," said Cowan.

Mr. Anderson is a biologist, SCS, Lincoln, Nebr.

Nebraska farmers are finding a good use for uncultivated corners in center-pivot irrigation systems: improved habitat for wildlife.

And in This Corner...

Wildlife

by Jeffrey K. Butcher

"I like wildlife. If you can tell me how to make a good living from the land and still have a place for wildlife, I would be all for it."

The time was 20 years ago. The speaker was a farmer explaining his interest in a conservation-wildlife habitat system to Soil Conservation Service Biologist Robert O. Koerner.

Koerner, now SCS State biologist in Lincoln, Nebr., had just started his career. At the time, he recalls, installing such a system required a good deal of ingenuity. The job is even more challenging today.

But it can be done.

One fresh opportunity in Nebraska derives from rapid conversion of land from idle or dryland farming to sprinkler irrigation. Center-pivot irrigation systems form circular cultivated tracts with four unirrigated and frequently uncultivated "corners." When managed with wildlife in mind, these corners offer birds and animals much-needed food and cover.

Nebraska already is the third largest among States with land under irrigation. Each corner of the center-pivot system contains from 4 to 8 acres. Koerner believes that "some of the best pheasant hunting in Nebraska could be provided in irrigated areas, if nesting and winter food and cover could be developed."

Fountain Farm at O'Neill, Nebr., illustrates his point. The LeDioyt Land Company, which manages this farm, strives to balance economics, natural resource conservation, and wildlife. Since 1967, the company has planted trees in just about every corner on 20 quarters of center-pivot irrigated land.

"The trees protect our livestock feedlots and buildings, besides providing erosion control and food and cover for wildlife," said Farm Superintendent Alfred Straka. "I certainly recommend this practice to others." So far, he has planted an estimated 85,000 trees, using a windbreak-wildlife conservation plan prepared with SCS assistance.

Straka wishes he'd started the work 20 years ago. "This land used to be mostly prairie," he recalls, "and game bird populations consisted mainly of prairie chickens and grouse. The native species became reduced when the prairie was converted to cropland. However, in the last 10 years, we have seen an increase in pheasant, quail, and deer."

The potential for repeating this experience in other parts of Nebraska is encouraging. Latest reports from the University of Nebraska's Conservation and Survey Division place the total number of quarter section systems in the State at close to 16,000. That adds up to a possible 400,000 acres in corners, about half of which could be managed for both livestock protection and wildlife habitat.

Increasing numbers of Nebraskans recognize the potential. From 1971 to 1976, the State planted an average of 2 million trees a year. In 1977, the number of trees planted rose to 3 million.

The Upper Elkhorn Natural Resources District planted 260,000 trees in 1977. About 50 to 60 percent of these went into center-pivot corners or followed the edge of a field.

A strong supporter of these plantings is Glenn H. LeDioyt. "We maintained the original shelterbelt of Chinese, or Siberian, elms on the Fountain Farm," he said, "and every year, we added large plantings of more adaptable species. We also fence and maintain all our plantings."

For LeDioyt and his company, the effort pays high dividends in satisfaction. "Last year, a covey of Hungarian partridge showed up strictly on its own in one of the windbreaks," he remembers. "We were as thrilled about it as we were when we calculated that our corn production was over 150 bushels per acre."

Biologist Koerner agrees that the effort is worthwhile. He suggests that another way to enlarge wildlife habitat in places like Fountain Farm is to plant a nesting crop, such as alfalfa, clover, or a mixture of grasses and legumes.

On a statewide basis, Koerner recommends delaying or controlling mowing until about July 15. This avoids harm to nesting cover. Koerner also suggests planting a mixture of taller trees for windbreak protection and low-growing trees or shrubs for wildlife food and escape cover.

Because most wildlife prefer a variety of cover types, Koerner advises landowners to vary their plantings. He recommends low-growing shrubs like amur honeysuckle, American plum, and skunkbush sumac. As intermediate trees, he suggests chokecherry, autumn olive, and Russian olive.

One caution: When corners adjoin road intersections, plantings should be made at least 50 feet diagonally from the center line where the two roads cross. This avoids creating blind corners for motorists. Plant grasses and legumes nearer the roads.

Trees and grasses planted in center-pivot corners provide food and cover for wildlife.

"The decision to develop center-pivot corners rests with local landowners," Koerner said. "They are the ones who must make the commitment."

For those who want to manage wildlife, assistance is available. Local SCS offices can help with design and layout, as well as with selection of adapted seed mixtures and species of woody plants.

Mr. Butcher was public information officer, SCS, Lincoln, Nebr., and is now public information officer, SCS, Lexington, Ky.

High-Power Habitat

An SCS district conservationist in Wisconsin improved a power line path on his property for wildlife habitat.

by Tom Michele

District Conservationist William Ludwig explains to Trees for Tomorrow students how he manages a power line right-of-way for wildlife.

Thousands of miles of electrical power transmission lines, strung on tall poles and towers, run through the lush, green woods of northern Wisconsin. Many acres of woods must be cleared for the power line rights-of-way, about 12 acres for each mile of a 100-foot-wide path.

William Ludwig, a district conservationist with the Soil Conservation Service, set a good example. He improved the power line path on his property for wildlife habitat.

Ludwig owns 70 acres south of Eagle River in Vilas County. In 1970, a public utility company built a high voltage electric transmission line from Three Lakes to Eagle River on an easement across his property.

"The rights-of-way for power lines are already committed to a particular use, but I wanted to plan for the land's maximum potential," Ludwig said. "I have a lot of woodland, but some of it is too dense for the kinds of plants to grow that provide food and cover for a variety of wildlife. I took advantage of the power line strips to improve habitat for wildlife."

SCS personnel provide technical assistance to landowners in planning the development or improvement of wildlife habitat including the management of rights-of-way. They help landowners identify plants that provide food and cover for wildlife and help them establish and maintain the plantings.

Soil tests showed that Ludwig needed to add lime to his soil to successfully grow the legumes that many wildlife species prefer. The lime corrects soil acidity and contains calcium which increases plant yield. Ludwig added 9 tons of lime and about 530 pounds of fertilizer per acre to the loamy sand soil on his cleared land under the power line.

The cost to lime, fertilize, and seed the area was about $170 per acre. The Agricultural Stabilization and Conservation Service provided 50-percent cost sharing for the wildlife habitat improvement project.

Ludwig planted a mixture of grasses and legumes—smooth bromegrass, orchardgrass, creeping red fescue, ryegrass, alfalfa, birdsfoot trefoil, ladino, and white dutch clover.

In addition to the perennial legumes and grasses he plants, Ludwig puts in small plots of buckwheat, sunflowers, rutabagas, rape, winter wheat, rye, and other annuals. He leaves native shrubs—elderberry, dogwood, hazelbrush, pincherry, juneberry, honeysuckle, blueberry, raspberry, and wild strawberries—growing in clump-like patches to provide food for wildlife and cover for nesting. Weeds provide seed for songbirds.

At different times of the year animals prefer one type of vegetation over another, but some are always attracted to succulent, juicy stems. Ludwig pointed out that planted areas can be mowed occasionally, except in nesting season, to keep plants in a succulent stage of growth and to control the growth of saplings.

The plantings attract songbirds, ruffed grouse, woodcock, cottontail and snowshoe rabbits, and white-tailed deer. There are plenty of signs that deer have fed on alfalfa, ladino clover, birdsfoot trefoil, and white dutch clover. The clearing also provides a place where deer can go to let the breeze blow insects off them.

The Trees for Tomorrow Environmental Center at Eagle River conducts tours and studies of Ludwig's project as part of its environmental education program. "Ludwig teaches soil conservation to our students and tells them about his wildlife habitat improvement activities," said Gene Wirsig, Trees for Tomorrow executive director. "He takes the students out to his land and shows them what he has done."

Mr. Michele is a reporter for the *Rhinelander Daily News,* Rhinelander, Wis.

Photo courtesy Karl Johansson, Wisconsin Public Service Corporation.

Adapted from an article in the *Rhinelander Daily News,* Rhinelander, Wis.

Followup on Trees

Conservationists in West Virginia looked at the long-term effects of planting trees to reclaim surface mine sites.

by Ralph K. Williamson

A Siouxland poplar is examined by District Conservationist Quentin Bennett. The poplar, a western tree, showed spectacular growth after 14 years on a West Virginia surface mine site.

About 14 years ago, the West Fork Soil Conservation District, assisted by the Soil Conservation Service, planted trees to help reclaim surface mine sites near Clarksburg, W. Va. In the summer of 1977, SCS went back to the sites to see which species of trees helped stabilize mine spoil and which did not.

SCS employees studied plantings of black locust, red oak, European black alder, American sycamore, Siouxland poplar, baldcypress, and Virginia pine.

At one site, black locust trees planted in 1963 had grown 20 to 25 feet high and averaged 6 inches in diameter at breast height. The trees had been severely damaged by the locust borer, causing many of the original main stems to break off in the wind. But new shoots grew more stems, and the locust trees were still providing large amounts of leaf litter.

European black alder, a nitrogen-fixing tree, averaged 30 feet tall and measured about 5 inches in diameter after 14 years. However, alders planted on another site in 1964 were only 15 to 25 feet high and 3 inches in diameter. About half of the trees had multiple stems.

Among the pine trees that were planted, Virginia pine proved to be the best adapted. The trees survived in large numbers, grew quickly, and were not affected by insects or disease.

American sycamore and Siouxland poplar had low survival rates for saplings. But both species grew to considerable height and diameter. The American sycamore trees were about 30 feet high and 5 inches in diameter, and the Siouxland poplar grew 40 feet high and 8 to 10 inches in diameter after only 14 years. The poplars were suitable for pulpwood.

The red oak and baldcypress failed to survive. Red oak is one of West Virginia's most prominent forest trees but could not survive on the mine spoil, especially at droughty surface mine sites.

Broomsedge and other grass cover volunteered in some places, but in many areas the soil was too acid for the plants.

Initially, conservationists had expected the planted trees to protect surface-mined land adequately. The leaf litter from trees in mature forests protects the soil from the explosive impact of raindrops, and the trees' extensive root systems help carry water underground, almost eliminating runoff. Planted trees, however, take almost 10 years to develop closed crown canopies and provide little leaf litter to cushion raindrop impact and reduce erosion.

"Planting trees just wasn't enough to stabilize mine spoil," said John L. Gorman, SCS woodland conservationist in West Virginia. "SCS soon began recommending seeding grasses and legumes for protective cover on surface-mined land."

Today, in West Virginia, tall fescue, birdsfoot trefoil, and sericea lespedeza are planted to provide quick cover after mining and replacement of soil. Mulches are often used to protect the soil until grasses and legumes are established.

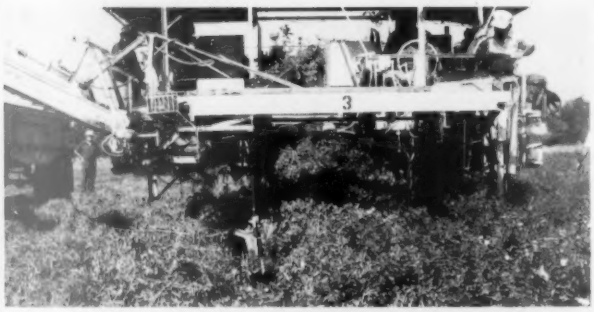
A combination of trees—Virginia pine, European black alder, or black locust—and herbaceous cover can be planted where the long-term land use is woodland.

Mr. Williamson is plant materials specialist, SCS, Morgantown, W. Va.

Looking West at Conservation

Louisiana farmers and bankers go West to view soil and water conservation activities in other States.

by Gene Warren



A high point of the tour was a visit to the Hendricks' farm in Woodland, Calif., where the bankers and farmers saw the machine harvest of tomatoes.

To launch a fourth decade of conservation tours, a group of Louisiana bankers and farmers headed West to visit three Pacific Coast States.

Why was this delegation so interested in resource conservation in the West?

"Because it helps to see how people in other parts of the country grow crops and how they view their successes and problems," explained Richard Hollier, Jr., President of the Louisiana Association of Conservation Districts.

"It makes you appreciate the food they grow that we enjoy," he continued. "It also helps Louisianans to do a better job of conservation back home."

Scheduled once every other year, these tours are sponsored by the Louisiana Association of Conservation Districts and the Louisiana Bankers Association. The first tour took place in 1947. Since then, several thousand Louisiana farmers and bankers have visited more than 40 States, as well as Canada and Mexico.

During last year's excursion, nearly 200 Louisianans began their 1-week tour in the fruit orchards of Washington, continued through the forests of Oregon, and concluded in California's highly productive Sacramento Valley.

The group started their tour with a bus ride through the scenic Washington countryside to an area near Mount Rainier. There, the visitors had a firsthand look at several water management systems tailored to local needs.

John Edwards, Soil Conservation Service district conservationist at Yakima, explained to the group that rainfall in the area averages only 10 inches per year. Much of the water used for agriculture in the dry valley comes from mountain snowpack. When the snow melts, water is caught in reservoirs and released to farmers through specially designed irrigation systems, such as gravity flow and sprinkler systems.

The group also toured several apple orchards to see how Washington State's No. 1 cash crop is grown, harvested, and distributed.

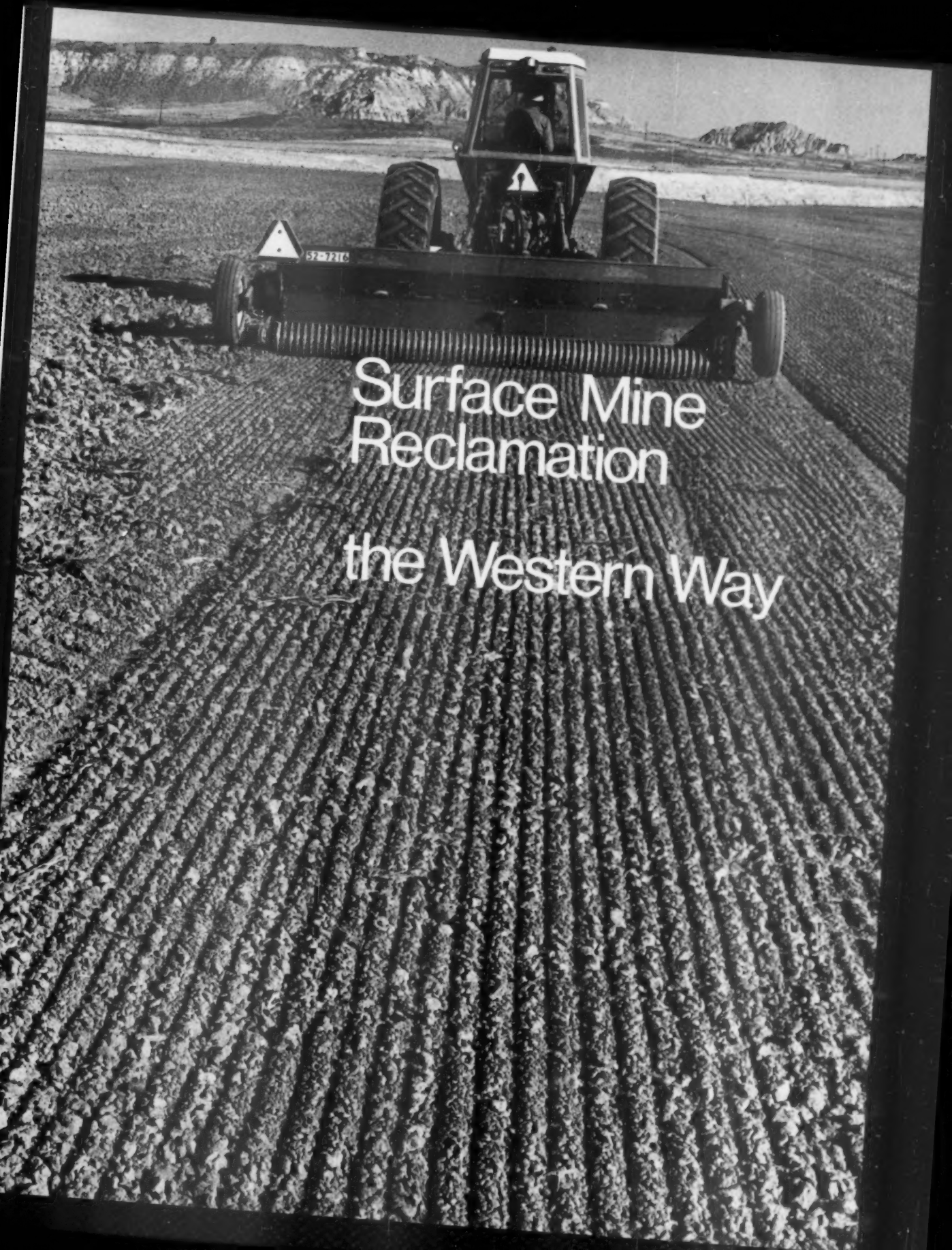
The next stop on the tour was Portland, Oreg., where the visitors saw a logging operation and looked at Douglas fir trees being harvested. Oregon also offered tours of a peppermint farm and a peppermint processing plant.

An excursion to California's Sacramento Valley and the Sacramento-San Joaquin Delta climaxed the trip. This area is considered by some to be the most productive land in the world. In Yolo County, tour members saw rice, barley, almonds, English walnuts, and tomatoes growing in well-tended fields. A side trip to an antique farm equipment show at the Hendricks' farm revealed much about the development of California agriculture.

Water management systems in the 481-square-mile delta aroused special interest among the group members. Because of the low elevation, soil saturation on much of the existing cropland in this area must be controlled. This involves pumping water into the Sacramento River and then back onto the land for irrigation. The group also viewed several large water control projects on the river and its tributaries.

Association President Hollier considered the tour one of the most successful in the series. "We saw sights that we had never seen before, such as the apple orchards, the fir trees, and the machine harvest of tomatoes," he noted. "I only wish other States could plan tours similar to ours. We would like to show off Louisiana."

Mr. Warren is public information officer, SCS, Alexandria, La.


Surface Mine
Reclamation
the Western Way

Wyoming and Montana have strict surface mine reclamation laws. They help assure that the land will be protected from permanent damage and restored to its premining condition or better.

by Anne Schuhart

Montana Mine Reclaimed for Grazing

The Decker coal mine in southeastern Montana produces more than 10 million tons of subbituminous coal a year. It also demonstrates that careful reclamation is no detriment to high production.

"Decker started producing coal in 1973, a year before the Montana surface mine reclamation law went into effect, but we planned for reclamation and salvaged topsoil from the beginning," said Gary Robbins, soil and revegetation specialist for Peter Kiewit Sons Company, Inc., the operating partner in the Decker Coal Company.

"We are reclaiming the land with native and adapted vegetation for grazing—that's what it was used for before. Everything we do in reclamation, such as grading and selecting seed, is geared toward that use.

"We follow three basic steps," Robbins explained. "First, we salvage the topsoil. We use soil surveys and laboratory analyses to identify all the soil material suitable for plant growth. Then we scrape it off and lay it back on a regraded area or stock-

Above, drag lines as long as football fields scoop out 70 cubic yards of overburden at a time and place it as fill in the previous cut. Right, after the cut is filled and graded, the topsoil is replaced and a seedbed is prepared.

pile it. Next we fill in the mine cut and regrade the fill to proper contours for good drainage."

The Decker mine is a series of horseshoe-shaped cuts. As the overburden is scooped out to expose the seam of coal in one cut, it is dumped as fill into the previous cut. The fill is shaped to approximate the original rolling landscape.

"Finally," said Robbins, "we replace the topsoil, prepare a seedbed, and plant."

Montana law requires the mining company to restore the land to its previous condition or better. The vegetation that is seeded must be capable of supporting domestic livestock and wildlife and capable of sustaining production at a rate equal to that before mining. Generally, native species are used.

"We reseed with a mixture mainly of wheatgrasses," said Robbins. "The subsoil here is high in sodium, but we select species adapted to the area and suited to our end purpose of grazing even though the species may not be salt tolerant. Many salt-tolerant plants are not that good for grazing."

The stockpiled topsoil also contains plant litter—seeds and roots. In addition to the seeded plants, some "volunteer" native species—such as sideoats and blue grama—regenerate directly from the litter when the topsoil is spread back over a graded area.

After the area is seeded, it is sprayed with 1 ton of wood mulch per acre. "The mulch is more to prevent soil crusting than erosion," Robbins said. "There is very little wind here and rainfall is less than 12 inches a year so erosion is not a big problem. The rain that does fall is diverted away from the mine, and water in the mine flows into a sediment basin.

"We control weeds by mowing after the first year's growth," he continued. "We don't use herbicides to kill the weeds because the herbicides would also kill some broadleaf species of legumes and shrubs we've included with the grasses in our planting mixture."

"The Soil Conservation Service assists us in all parts of reclamation," said Dwight Layton, head of reclamation for Decker Coal Company. "SCS specialists make range inventories and soil surveys for us, help in planning, and recommend plant materials."

The plant materials center operated by SCS in Bridger, Mont., has used the Decker mine for extensive field plantings of 'Rosana' western wheatgrass, 'Critana' thickspike wheatgrass, and 'Wytana' fourwing saltbush and for trial plantings of white prairie clover. USDA's Forest Service, Montana State University, and others also use the mine for trial plantings and reclamation research.

Provisions for wildlife are made throughout the Decker operation. Cooperating with the U.S. Fish and Wildlife Service and the Montana Department of Fish and Game, for example, the company constructed a dike on land between the Decker Mine and the Tongue River Reservoir. Beginning this spring, mine discharge water that has been proven safe in

Wood mulch is sprayed over newly seeded areas at a rate of 1 ton per acre to prevent soil crusting on the surface and to protect against erosion.

Dwight Layton, head of reclamation for Decker Coal Company, checks natural regeneration on a reclaimed bank. Although the bank was seeded, native seeds that were dormant while the topsoil was stockpiled are also taking root.

tests will be released behind the dike to maintain a constant shallow water area for spawning pike and nesting geese. Gates in the dike connect the marsh to the reservoir.

"We continuously monitor the wildlife and what effect mining is having on it," said Layton. "For instance, we found that for some reason reclaimed areas attract a large number of rodents. To keep the population from getting out of hand, we set up bird boxes to attract American kestrels, or sparrow hawks, which eat insects and small mammals."

"We also have a large population of antelope and deer," Robbins added. "We don't do anything specifically to attract them, but they seem to know they're safe from hunters here."

As a followup to reclamation at the Decker mine, the growth of seeded plants is checked at least once a year.

The Decker company also maintains a series of wells within reclaimed areas to see if ground water will flow into the spoil and if the spoil will act as an aquifer to hold the water. The wells also are used to monitor the quality of ground water.

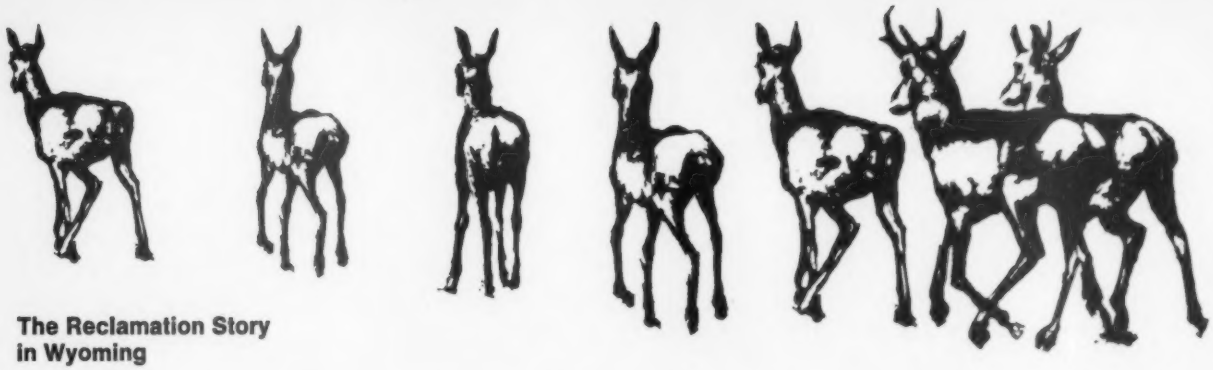
"Our mining permit will cover about 2,000 acres," said Layton. "Right now, about 500 acres have been disturbed and nearly 200 acres of that are reclaimed. We're catching up, but over the life of the mine, there will always be about 100 acres disturbed for current operations."

Reclamation is so interwoven with mining operations at the Decker company that all phases—from stockpiling topsoil to monitoring reseeded vegetation—go on concurrently as successive pits are opened and filled.

When the coal is finally exhausted, reclamation at the Decker mine will not be completed until topsoil is spread where the headquarters now stands, the last acre is seeded and mulched, and the range is returned to grazing livestock.

At right, Dwight Layton (left) and Gary Robbins check a series of monitoring wells at the edge of a reclaimed area.

Bird houses attract American kestrels which control the rodent population on reclaimed areas. Far right, discharge water from the Decker mine will be used to maintain a shallow water area behind a new dike as a spawning area for pike and a nesting area for geese.



The Reclamation Story in Wyoming

The demand for coal has grown rapidly in the last few years, but Wyoming's surface mine reclamation laws have kept pace with production.

"Coal has been mined in northeastern Wyoming since the 1890's, when the railroad came through, and it's been surface mined since the 1940's," said Francis A. Smith, Soil Conservation Service district conservationist at Sheridan.

"Wyoming passed its first surface mine reclamation act in 1969, and in 1973, the legislature passed another stricter law partly because of the number of new pits being dug," he continued.

"Basically, the 1973 law says that all surface-mined land will be reclaimed to a condition capable of supporting its highest use prior to mining. For example, if the land was always used for range, it can be reclaimed for range; but if it was ever used for crops or hay, it must be reclaimed so that it could again be used for crops or hay.

"The law also says that in applying for a mining permit, mining companies may have their reclamation plan reviewed by the local conservation district before submitting it to the State Department of Environmental Quality," Smith explained. "The services of the district are available to the mining companies just as they are to local farmers and ranchers."

In many conservation districts, SCS helps the mining companies develop their reclamation plans. The first step is making a standard soil survey of the area leased for mining. SCS soil scientists study soil profiles at sample sites to a depth of about 60 inches.

"The survey includes descriptions of the soil series and descriptions of soil associations and complexes," said Smith.

A reclamation plan must include an estimate of the amount of topsoil needed to cover disturbed land after mining plus 25 percent of that to allow for compaction. If the land had been irrigated before mining, the company must cover the fill with 30 inches of topsoil; if it was dryfarmed cropland or pasture, 24 inches; and if it was range or woodland, 18 to 20 inches.

"If requested, during the planning process we make a complete inventory of what's on the land before mining," said Smith. "We map the range sites, determine their condition, and analyze the vegetation. We also suggest initial stocking rates." The information will be used not only to plan reclamation but also after reclamation to determine if the sites were restored to equal or better carrying capacity.

Based on the inventory, SCS recommends grades for leveling, specifications for seeding, location of fences, planned grazing systems, stockwater facilities, and other conservation work for reclaiming the land and managing it afterwards.

The recommendations are specific. For example, recommendations SCS makes for proper grazing use by cattle include the key species to be grazed, when and how much they should be grazed, the leaf length needed to begin grazing, the minimum stubble height during grazing,

Shovels and trucks are used instead of drag lines to remove the overburden at the Big Horn coal mine north of Sheridan, Wyo. This allows more precise placement of the overburden as fill in other cuts.

A mining company's permit application must include studies of surface and subsurface water and plans to protect water quality.

and the minimum regrowth needed before a killing frost.

"The coal company must have the soils information before it can draw up an engineering plan for mining," Smith said. When the range inventory and yardage computation are complete, SCS and the mining company work on completing the reclamation and engineering plans.

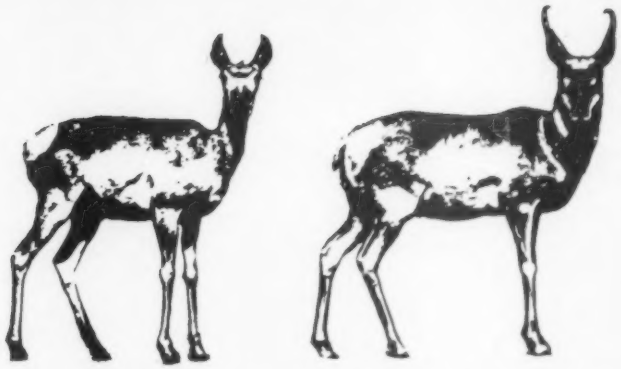
In the permit application, the mining company must also include a wildlife inventory, lists of adjacent surface and mineral owners, a description of historical and present land use, studies of surface and subsurface water, a list of adjudicated water rights, and numerous other lists and maps—all in detail.

For example, the baseline wildlife inventories must include the kind and approximate populations of all wildlife in the region, from mule deer to garter snakes; which animals live on the permit area, use it for hunting, migrate through it, and winter on it; and measures the company will take to mitigate the effect of mining disturbance on wildlife. There is also a continuous wildlife monitoring program throughout all stages of mine development.

Finally the coal mining company must post bond for the estimated cost of the reclamation work to guarantee that all the requirements will be met.

Wyoming's strict law and permit requirements do not discourage coal mining in the State—mining is too profitable a venture. They do, however, give the State firm control over the condition in which the land will be left when the coal is gone and the mining companies move on to other deposits.

Paul Lupcho, SCS soil scientist at Sheridan, Wyo., takes a soil sample at a site leased for mining by the Black Mountain Coal Company. Soil surveys are the basis for mine reclamation plans.



Uranium Mines: A Special Reclamation Problem

One of the richest uranium deposits in the world is in the Shirley Basin, on the high plains southwest of Casper, Wyo.

Reclaiming uranium mines is different from reclaiming coal mines. The goal is the same—to return the land to its previous condition or better—but uranium and the way it is mined present special problems.

"It takes a heck of a hole just to get a little uranium out," explained Charles McAfee, Soil Conservation Service range conservationist for Wyoming. "It can take a company 2 years to get the overburden off before they can even start mining."

A pit operated by the Lucky Mc Uranium Corporation covers 403 acres. The company had to dig down 382 feet to reach a 6- to 22-inch layer of uranium ore.

Shovels and trucks remove the overburden. Then, using a geiger counter, one man surveys and stakes out exactly where backhoes should scrape for the thin layer of ore.

Coal companies have to remove about 4 to 5 tons of overburden per ton of coal; uranium companies have to remove 71 tons of overburden per ton of uranium ore. The ore is then processed into uranium oxide, or "yellow cake." Each ton of ore produces only about 4 pounds of yellow cake.

"This pit produces about 2 million pounds of yellow cake a year—10 percent of all the uranium oxide produced in the country," according to an official at the mine. "It's used to generate power, but it has to be 'enriched,' or further refined, first."

Many surface mines for coal are a series of cuts; the overburden from one cut is used to fill in the previous cut. But in a uranium mine, the entire pit is opened at one time and the spoil is piled around the top of the pit.

"Erosion is a problem on the spoil piles because they are 200 feet high and the outslopes are long," said McAfee. "Gully erosion caused by compacted snowdrifts melting in the spring is especially bad. The company plans to try using fences to disperse the snow or an aspen fiber blanket on the slopes to slow runoff enough for plants to take hold.

"Erosion also is aggravated because seeding the spoil has to be delayed. The miners have trouble in the pit with landslides because they are mining in an aquifer. They have to haul the slide material out of the pit and dump it on the spoil. Topsoil isn't spread and seed isn't planted until the miners have finished building up the spoil in a particular area. Even so, the spoil covers 690 acres and more than 500 acres of that has been reclaimed."

After all the uranium has been extracted, overburden from a new pit will be used as fill. The disturbed area will then be graded, covered with topsoil, and seeded.

"The company has already used a number of plant species for seeding—wheatgrasses, yellowblossom sweetclover, fourwing saltbush, and Indian ricegrass—depending on the availability of seed," said Lon Young, SCS agronomist for Wyoming.

To help select vegetation suitable for stabilizing mine spoil, SCS

Uranium mining in the Shirley Basin means digging out as much as 400 feet of overburden to expose a 6-inch layer of uranium ore.

planted test plots of species developed at the plant materials center operated by SCS at Bridger, Mont.

"The biggest problem with our plant materials is that they are nice and green and the antelope come in and nibble them right to the ground," said Young. "Fencing to exclude animals may be needed until the plantings are well established."

"SCS also recommends that we work with a prepared seedbed on the spoil," a company spokesman said. "After we spread the topsoil, we add 160 pounds of 40-40-0 fertilizer per acre, disk and harrow the soil, and seed barley, which establishes itself much faster than native plants. We mow the barley after the first year's growth and seed native plants directly into the stubble.

"We prefer using a cover crop instead of mulch because it gives better, deeper protection and it improves the soil at the same time."

But even the best seedbed preparation does not guarantee success. "The average precipitation is only 11 inches a year, and it falls mostly in April through June," said Young. "Last June was very dry, and that makes quite a difference here because June is when the cool-season grasses put out their best growth. The dry weather really hurt the seeding.

"We are working with a very fragile environment," he continued. "We are at a high elevation; the growing season is short and the winters are harsh; rainfall is low but intense. The plants that can grow here do not provide thick cover. Even under the best conditions, the vegetation isn't much."

Ms. Schuhart is a writer-editor, Information Division, SCS, Washington, D.C.

Fencing to exclude animals may be needed in reclaimed areas until plants are well established.

Woodlands: A Growing Resource

by Howard W. Beery

An Ohio soil and water conservation district campaigns for improved woodlands to control erosion, provide wildlife cover, and increase farm income.

Landowners are taking a close look at woodland management in Carroll County, Ohio, and with good reason. Almost half of the county is woodland —more than 113,000 acres are in oak, maple, ash, and red and white pine.

The Carroll County Soil and Water Conservation District (SWCD) board of supervisors recognizes these woodlands as a valuable resource and is actively promoting good woodland management.

"With a complete woodland improvement program in the county," said SWCD Chairman Art Rummell, "we could produce an additional 23 million board feet of lumber each year. That would be worth about $1.7 million a year."

One source of assistance available to landowners, according to Rummell, is the Ohio Department of Natural Resources. The department supplies service foresters who will make a site visit at the landowner's request and recommend woodland management practices.

"A woods is like a carrot patch," said Cloyce Riddle, service forester for Carroll and three other counties. "It needs to be tended and thinned so the owner can get big, high-quality trees."

On a typical site visit, Riddle walks through the woods with the landowner to see what the woods can produce and to determine what the owner wants from the land.

"On a site visit we make an inventory of the trees and then decide about thinning and harvesting them," explained Riddle. "We also make recommendations for removing dead trees and vines and killing unwanted vegetation."

The service forester helps the landowner develop a harvest plan which includes judging board feet and marking harvestable trees.

Another source of assistance for landowners in Carroll County is the Soil Conservation Service. The SCS field office staff in Carrollton, working through the SWCD, helps district cooperators select the kinds of trees that will grow best on their land. Using information gathered in the soil survey, the staff determines the capability of a particular type of soil for wood production potential.

"Soils information is like money in the bank when a landowner plants trees," said Rummell. "Why waste time, effort, and money planting the wrong kind of trees when you can plant those best suited to the soils you have?"

SCS also helps the landowner with plans to control erosion during woodland harvesting and to minimize loss of soil nutrients. Plans may incorporate such practices as building logging roads along the contour; keeping road grades gentle —3 to 10 percent; keeping roads away from steep hillsides, especially on soils subject to slippage; using bridges and culverts to cross waterways; outsloping road surfaces to prevent water collection; and installing waterbars to carry water off roads. Other practices include installing small diversions and seeding grass, such as tall fescue, on temporary logging roads to reduce erosion.

Mr. Beery is district conservationist, SCS, Carrollton, Ohio.

A woodland of mixed hardwoods is typical of those in Carroll County, Ohio.

Trees and Shrubs, Where Are You?

Three agencies are working together to develop new and improved varieties of trees and shrubs for conservation activities in Montana.

by Brad Anseth

Mitosis, the process of cell division in plant or animal growth, has a new meaning in Montana. MITOSIS stands for the Montana Interagency Tree or Shrub Improvement Study.

MITOSIS grew out of a recommendation by Harold Hunter, SCS woodland conservationist, and Robert Lohmiller, SCS plant materials specialist, that the plant materials center (PMC) operated by SCS in Bridger, Mont., expand its activities to include trees and shrubs. They also recommended that the PMC work with other agencies to improve woody plants and set up a seed certification process for woody plants.

At the end of 1975, as a result of these recommendations, the Division of Forestry of the Montana Department of Natural Resources and Conservation signed an agreement with USDA's Forest Service and Soil Conservation Service to combine programs and resources. Their aim was to speed up the selection of improved trees and shrubs for conservation purposes, such as field and farmstead windbreaks; wildlife habitat improvement; mined land reclamation; and revegetating transportation and utility corridors, logging roads, and greenbelts. Plant development of commercial timber species was not an objective of the program.

Under the agreement, the three agencies developed a project outline and schedule. Three of the four major projects are well underway.

Project One

Under project one, SCS employees located superior tree and shrub species in windbreaks throughout Montana. They gave Harold Hunter—MITOSIS chairman—the locations, and Hunter arranged for representatives from the other agencies participating in MITOSIS to make final species selections.

The seeds from the superior shrubs and trees were collected by 4–H groups under the supervision of SCS personnel.

Project Two

With the seed collected, project two began. The performance of the improved plants will be compared to that of standard plant materials.

"We were so sure of the superiority of some of the species we collected," Hunter explained, "that the State forest tree nursery went into immediate production."

Some of the seed believed to be superior was labeled and is being grown to seedling size by the State Division of Forestry's Forest Tree Nursery. The seedlings will then be sent to the plant materials center in Bridger where they will be used in the regular plant materials evaluation program. Through this program the superiority of the plant material will be established.

Project Three

Project three deals with a problem of establishing conifers.

"Because conifers are green yearround, long lived, and relatively disease free when compared to other trees, I felt they should be used more than they are now," said Hunter. "However, landowners were getting discouraged because conifers are so hard to establish."

Under the MITOSIS agreement, the Division of Forestry grows the trees for project three and SCS tests and evaluates the growth through the plant materials program as in project two.

Project Four

Project four is a last resort, according to Lohmiller. "Only if projects one and two don't produce, do we go to project four. If plants can't be found to do what's necessary, then new plants will be developed to do the job under the MITOSIS project," explained Lohmiller.

"MITOSIS also hopes to insure that superior seed sources are protected," he continued. This may be done through formal agreements with current owners of superior sources or by reestablishing the sources at the forest tree nursery, plant materials center, Forest Service nursery or seed orchard, or Montana Agricultural Experiment Station.

Other Projects

The MITOSIS group is working on two other projects. "There is no seed certification for woody plants in Montana," Hunter said. "MITOSIS is going to work through the Montana Seed Growers Association, the State's grass and seed certification organization, to set some standards for woody plant certification."

MITOSIS is also cooperating with the Forestry Committee of the Great Plains Agricultural Council, a multi-State group dedicated to improving agriculture in the Great Plains. The committee identified a need to improve Rocky Mountain juniper and

Eastern red cedar for conservation purposes in the Great Plains after it determined that these were the species most technicians felt had high priority for study.

Four acres of the plant materials center have been set aside to grow and evaluate juniper from Montana and Wyoming accessions. George Howe of the Forest Service is coordinating the activities of the council and MITOSIS.

"MITOSIS is not intended to be an exclusive three-agency program," Hunter pointed out. "Any organization in or serving Montana that can identify mutual benefits is welcome to join."

"Private nurseries will probably become more and more involved as the program continues," said Lohmiller. "MITOSIS is designed to identify outstanding woody plants and give them to the Division of Forestry's nursery to grow until there is a demand so the private nurseries can grow and market them economically.

Richard A. Cunningham, formerly with the Forest Service and now with the Science and Education Administration, played an active role in the development of MITOSIS. He summed up the project when he said, "The progress of MITOSIS has been outstanding and shows promise of becoming a model for effective interagency cooperation in an action program."

Under the MITOSIS project, seeds are collected from superior tree and shrub species in windbreaks.

Mr. Anseth is public information officer, SCS, Bozeman, Mont.

Soil Maps on Trail of Bog Turtle

Soil maps help locate the habitat of an endangered species in Maryland.

by Nadine E. Pitts

When Marylanders became concerned about one of the State's endangered species of wildlife, a biologist devised a novel approach to mapping its habitat.

Gary J. Taylor, nongame and endangered species program manager for the Maryland Wildlife Administration, conceived the idea of using soil survey maps to locate actual and potential habitat of the bog turtle, *Clemmys muhlenbergi*.

"I remembered from a soils class at college that soil surveys have good base maps to scale," said Taylor. "The surveys turned out to be just what I needed."

Taylor asked the Baltimore County Soil Conservation District and the Soil Conservation Service for help. Martin Gordon, SCS district conservationist, now retired, provided Taylor with county soil maps and assisted him in interpreting them.

"Using the soil maps to plan the survey was the most efficient method available to us," said Taylor.

A limited budget, the secretive nature of the bog turtle, and its disjunctive pattern of distribution made the habitat survey difficult. At the time the survey was undertaken, bog turtle habitat had been reported in four Maryland counties—Baltimore, Carroll, Cecil, and Harford—a 1,861-square-mile area. Because of its popularity as a pet and the scattered distribution of the scarce habitat, the turtle had been placed on the State's endangered species list in 1973.

Taylor and Gordon examined the soil maps and pinpointed soil types having properties that support the habitat favored by the turtle. It prefers spring-fed bogs, seepages, or wet meadows where there is a constant source of cool water in trickles or rivulets through September. The turtles use the rivulets as travel lanes through moderate to dense vegetation such as skunk cabbage, rice cutgrass, and jewelweed. Turtle colonies have been found in several soil types, all of which occur in lowland areas paralleling streams.

Following leads provided by the maps, the field team investigated potential sites plotted on soil survey sheets. When they began the survey in Baltimore County, they knew of only seven colonies of turtles. After the survey, they had discovered 24 new colonies and 183 potential sites.

The team was equally successful in using the soil maps for Carroll County. There, they knew of only five colonies. After studying soil survey sheets for the northeastern section of the county, they found 51 new

Dark areas on soil survey map indicate soil types which might support habitat favored by the turtle.

At left, the turtle favors spring-fed bogs, seepages, or wet meadows where there is a constant source of cool water. At right, the bog turtle was placed on Maryland's endangered species list in 1973.

—courtesy, Maryland Wildlife Administration.

colonies and located 115 potential sites. Data for the other counties have not yet been analyzed.

Neither mowing nor moderate grazing seems to affect the bog turtles adversely, Taylor and his colleagues found. Moderate grazing actually appeared to improve conditions by creating pockets of water and softer soil for burrowing.

"Owners of the turtle sites are responding favorably to preserving the turtle's habitat," said Rick Dills, current SCS district conservationist in Baltimore County. Taylor agreed, explaining that most owners are grateful to learn the importance of their land for the species.

Ms. Pitts is a writer-editor, Information Division, SCS, Washington, D.C.

Meetings:

May	
1–5	League of Women Voters, Cincinnati, Ohio
6–7	Sierra Club, San Francisco, Calif.
6–9	National Forest Products Association, Washington, D.C.
17–19	Boy Scouts of America, Phoenix, Ariz.
17–19	Southern Forestry Conference, Savannah, Ga.
June	
4–8	National Council of State Garden Clubs, Inc., Detroit, Mich.
4–9	General Federation of Women's Clubs, Phoenix, Ariz.
6–12	Outdoor Writers Association of America, Virginia Beach, Va.
19–27	Soil Science Congress, Edmonton, Alberta, Canada
24–29	National Environmental Health Association, Snowmass, Colo.
26–28	American Plywood Association, Portland, Oreg.
25–28	National Watershed Congress, Toronto, Ontario, Canada
25–29	American Seed Trade Association, Inc., Kansas City, Mo.
25–30	American Water Works Association, Atlantic City, N.J.
26–30	Air Pollution Control Association, Houston, Tex.
27–30	American Society of Agricultural Engineers, Logan, Utah
July	
8–12	National Association of Counties, Atlanta, Ga.
15–19	American Association of Nurserymen's Convention, New Orleans, La.
19–21	Izaak Walton League of America, Inc., French Lick, Ind.
23–27	National Federation of Business and Professional Women's Clubs, Inc., San Juan, Puerto Rico
30–Aug. 2	Soil Conservation Society of America, Denver, Colo.

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